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Test 552: Allis-Chalmers Model HD-16A

Tractor Museum
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The Experiment Station
University of Nebraska College of Agriculture
W. V. Lambert, Director, Lincoln, Nebraska

Department of Agricultural Engineering
Dates of test: July 6 to 18, 1955
Manufacturer: ALLIS-CHALMERS MANUFACTURING COMPANY, SPRINGFIELD, ILLINOIS
Manufacturer's rating: Not rated

NEBRASKA TRACTOR TEST NO. 552

ALLIS-CHALMERS HD16 A

BELT HORSEPOWER TESTS

Hp	Crank shaft speed rpm	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hour	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TESTS B & C—100% MAXIMUM LOAD—TWO HOURS								
133.83	1600	9.091	14.72	0.477	0.00	178	82	28.970
TEST D—RATED LOAD—ONE HOUR								
120.35	1600	8.275	14.54	0.482	0.00	168	90	28.960
TEST E—VARYING LOAD—TWO HOURS (20 minute runs; last line average)								
120.59	1600	8.305	14.52	0.483	...	168	90	.....
2.31	1686	2.904	0.80	8.818	...	159	93	.....
62.23	1645	5.367	11.59	0.605	...	164	92	.....
129.79	1549	8.660	14.99	0.468	...	171	94	.....
31.56	1656	4.033	7.83	0.896	...	160	93	.....
91.32	1615	6.667	13.70	0.512	...	166	94	.....
72.97	1625	5.989	12.18	0.576	...	165	92	28.935

TORQUE (At Dynamometer)									
Eng rpm	1600	1494	1393	1300	1202	1100	1006	896	800
Lb-ft	703.9	724.5	743.8	774.4	766.5	763.0	720.7	706.0	728.5
Dyn rpm	976	912	850	792	733	671	613	546	498

DRAWBAR HORSEPOWER TESTS

Hp	Draw bar pull lb	Speed miles per hr	Crank shaft speed rpm	Slip of drive wheels %	Fuel Consumption: Gal per hour	Fuel Consumption: Hp-hr per gal	Fuel Consumption: Lb per hp-hr	Water used gal per hour	Temp Deg F: Cooling med	Temp Deg F: Air	Barometer inches of mercury
TEST H—RATED LOAD—TEN HOURS—2nd Gear											
93.56	17,162	2.04	1600	2.68	7.721	12.12	0.579	0.00	167	80	28.884
TESTS F & G—100% MAXIMUM LOAD											
101.21	28,743	1.32	1607	6.15	1st gear (Part throttle)				167	86	28.955
118.69	21,735	2.05	1606	2.93	2nd gear				165	77	28.920
118.78	15,105	2.95	1598	1.44	3rd gear				168	90	28.900
115.89	11,271	3.86	1602	0.79	4th gear				168	90	28.900
112.26	9,465	4.45	1601	0.68	5th gear				168	86	28.900
107.14	6,930	5.80	1603	0.68	6th gear				170	86	28.900

FUEL, OIL and TIME Diesel fuel Cetane No. 50 (rating taken from oil company's typical inspection data); **weight per gallon** 7.015 lb **Oil** SAE 30 **to motor** 6.539 gal **drained from motor** 6.146 gal **Total time motor was operated** 39½ hours.

CHASSIS Type Tracklayer **Serial No.** HD-16A 282 **Tread width** 74" **Measured length of track** 24.94 ft. **Cleats** integral with shoes **Cleats per track** 38 **Size of cleats** 22" x 2 19/32" **Advertised speeds mph** first 1.4 second 2.1 third 3.0 fourth 3.9 fifth 4.5 sixth 5.8 reverse 1st rev 1.5 2nd rev 3.5 3rd rev 4.5 **Belt pulley** diam 18" face 15" rpm 693 **Belt speed** 3265 fpm **Clutch** single plate over center operated by hand lever **Seat** upholstered **Brakes** contracting bands operated by two foot pedals **Steering** hydraulically controlled multiple disc clutches.

ENGINE Make Allis-Chalmers Diesel **Type** 4 cycle 6 cylinder vertical **Serial No.** 6320 **Crankshaft mounted** lengthwise **Head** I **Lubrication** pressure **Bore and stroke** 5¼" x 6½" **Rated rpm** 1600 **Compression ratio** 14.15 to 1 **Displacement** 844 cu in **Port diameter valves** inlet 2" exhaust 1.812" **Governor** variable speed centrifugal **Starting system** 24 volt **Air cleaner** oil washed wire mesh with precleaner **Oil filter** 2 full flow replaceable pleated paper elements **Fuel filters** 2 full flow replaceable wound cotton yarn elements in both primary and secondary filters **Cooling medium temperature control** thermostat.

TOTAL WEIGHT AS TESTED (With operator) 32,375 pounds.

REPAIRS AND ADJUSTMENTS No repairs or adjustments.

REMARKS All test results were determined from observed data and without allowances, additions or deductions. Tests B and F were made with fuel pump set to develop approximately 140 corrected maximum belt horsepower and data from these tests were used in determining the horsepower to be developed in tests D and H, respectively. Tests C, D, E, G & H were made with the same setting.

HORSEPOWER SUMMARY

	Drawbar	Belt
1. Sea level (calculated) maximum horsepower (based on 60° F and 29.92" HG)	124.79	141.11
2. Observed maximum horsepower (tests F and B)	118.69	133.83
3. Seventy-five per cent of calculated maximum drawbar horsepower and eighty-five per cent of calculated maximum belt horsepower (formerly ASAE and SAE ratings)	93.59	119.94

We, the undersigned, certify that this is a true and correct report of official tractor test No. 552.

L. F. LARSEN
Engineer-In-Charge

L. W. HURLBUT
G. W. STEINBRUEGGE
J. J. SULEK
Board of Tractor Test Engineers

EXPLANATION OF TEST REPORT

TEST A: The manufacturer's representative operates the tractor for a minimum of 12 hours using light to heavy drawbar loads in each gear.

This serves as a period for limber up, general observation and adjustments. Adjustments that are permissible include valve tappet clearance, breaker point gap, spark plug gaps, clutch and others of a similar nature. No new parts or accessories can be installed without having mention made of it in the report.

No data are recorded during this preliminary run except the time that the engine is operated.

BELT HORSEPOWER TESTS

TEST B: The throttle valve is held wide open and the belt load on the dynamometer is adjusted so that the engine is at the rated speed recommended by the manufacturer. Carburetor, ignition timing and manifold adjustments are all set for maximum engine power.

This test is designed to determine maximum belt horsepower of the tractor at rated speed and to measure fuel consumption at the maximum power on the belt.

TEST C: For tractors with carburetors the best fuel economy does not always occur when the engine develops maximum power at rated speed. Test C is intended to allow the manufacturer's representative to select a more economical fuel setting even though there is a slight loss of power. *This more practical carburetor setting is used in all later tests except test F.* The throttle valve is held wide open and load adjusted to give rated rpm. Tests B and C are the same for diesel tractors, which have an altogether different fuel system.

TEST D: The throttle control lever is set so that the governor will maintain rated engine speed when rated load is applied. Rated load is 85% of 100% maximum, as obtained in test B, corrected to standard conditions.

This rating is somewhat less than the maximum belt horsepower in order that the operator may have a certain amount of reserve.

TEST E:

Varying load serves to show the range of engine speeds when the engine is controlled by the governor during the following varied loads, of 20 minutes each: rated load, no load, ½ rated load, maximum load at wide open throttle valve, ¼ and ¾ rated load.

The average result of this test shows the average power and fuel consumption. Since the average tractor is subjected to varying loads, these data serve well in predicting fuel consumption and efficiency of a tractor in general use.

Torque, lb-ft at dynamometer, is obtained with wide open throttle and sufficient load is applied to give several readings.

DRAWBAR HORSEPOWER TESTS

In all drawbar tests the pull exerted by the tractor is transmitted by a hydraulic pressure cylinder to a recording instrument in the test car. All tests are made on the same dirt test course which is maintained by grading, sprinkling and rolling so that it remains very nearly the same throughout the season. The same tires, wheels and weights are used for all tests except J and K.

TEST F: A drawbar test, the results of which are used to determine the rated drawbar horsepower in test H. The carburetor is set to develop maximum power as in test B. The rated gear recommended by manufacturer as plow gear is used in this test. The drawbar load is adjusted to give rated engine speed.

TEST G: Maximum drawbar horsepower is determined in each gear when the carburetor is set for fuel economy as in test C. The throttle valve is held wide open and the load is applied so that the engine runs at rated engine speed.

When operating in low gear it is not uncommon for the tractor to develop less drawbar horsepower than in rated gear because of excessive wheel slippage. When excessive wheel slippage occurs the load is reduced until slippage approaches 16%. When the load is reduced it is necessary to operate the tractor engine at part throttle and control engine speed by governor action.

TEST H: Intended to test the ability of the tractor to run continuously for 10 hours at rated drawbar horsepower and to determine the fuel consumption during that time. Rated drawbar horsepower is 75% of 100% maximum drawbar horsepower (Test F), corrected to standard conditions.

When operating at rated load the throttle control lever is set to maintain rated engine speed. This rating is less than maximum drawbar horsepower in order that the operator may have a certain amount of reserve.

TEST J: The tractor is operated in rated gear with all added weight removed. This test shows the effect of the removal of added weight on the performance of the tractor when compared with test G.

Removal of wheel weights generally increases wheel slippage and decreases drawbar horsepower.

TEST K: Similar to test J except that the smallest tires and lightest wheels offered by the manufacturer are used.